# Extreme Networks® Pluggable Interface Modules Installation Guide

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# Preface

This preface provides an overview of this guide, describes guide conventions, and lists other publications that might be useful.

**WARNING!**

*Service to all equipment should be performed by* ***trained and qualified service personnel only.*** *Before installing or removing any components of the system, or before carrying out any maintenance procedures, you must thoroughly read the safety information provided in Appendix A of this guide.* ***Failure to follow this safety information can lead to personal injury or damage to the equipment.***

## Introduction

This guide provides information about installing pluggable interface modules in the following Extreme Networks® switches:

- BlackDiamond® 8800 series switches
- BlackDiamond 10808 switch
- BlackDiamond 12800 series switches
- BlackDiamond 20808 switch
- Summit® family switches:
  - Summit X150 series switches
  - Summit X250e series switches
  - Summit X450 series switches
  - Summit X450a series switches
  - Summit X450e series switches
  - Summit x650 series switches

**NOTE**

*The Summit X150 series switches, Summit X250e series switches, Summit X450 series switches, Summit X450e series switches, Summit X450a series switches, and Summit X650 series switches are called the Summit family switches when referred to collectively.*

The types of pluggable interface modules used in Extreme Networks switches include small form factor pluggable (SFP) modules, XFP transceivers, and XENPAK modules.

This guide is intended for use by network administrators responsible for installing and setting up network equipment. It assumes a basic working knowledge of:

- Local area networks (LANs)
- Ethernet concepts
- Ethernet switching and bridging concepts
- Routing concepts
- Simple Network Management Protocol (SNMP)

See the *ExtremeXOS 12.2 Concepts Guide* and the *ExtremeXOS 12.2 Command Reference Guide* for information about configuring Extreme Networks BlackDiamond 8800 series switches, BlackDiamond 10808 switches, BlackDiamond 12800 series switches, or Summit family switches.

See the hardware installation manuals listed under "Related Publications" on page 7 for information about installing BlackDiamond 8800 series switches, BlackDiamond 10808 switches, BlackDiamond 12800 series switches, or Summit family switches.

**NOTE**

*If the information in the installation note or release note shipped with your Extreme Networks switch differs from the information in this guide, follow the installation or release note.*

# Conventions

Table 1 and Table 2 list conventions used throughout Extreme Networks publications.

**Table 1: Notice icons**

| Icon | Notice Type | Alerts you to... |
|---|---|---|
| | Note | Important features or instructions. |
| | Caution | Risk of personal injury, system damage, or loss of data. |
| | Warning | Risk of severe personal injury. |

**Table 2: Text conventions**

| Convention | Description |
|---|---|
| `Screen displays` | This typeface represents information as it appears on the screen, or command syntax. |
| The words "enter" and "type" | When you see the word "enter" in this guide, you must type something, and then press the Return or Enter key. Do not press the Return or Enter key when an instruction simply says "type." |
| [Key] names | Key names appear in text in one of two ways:<br>• Referenced by their labels, such as "the Return key" or "the Escape key"<br>• Written with brackets, such as [Return] or [Esc]<br>If you must press two or more keys simultaneously, the key names are linked with a plus sign (+). Example:<br>Press [Ctrl]+[Alt]+[Del]. |
| Words in italicized type | Italics emphasize a point of information or denote new terms at the place where they are defined in the text. |

# Related Publications

The Extreme Networks ExtremeXOS™ switch documentation set includes:

- *ExtremeXOS 12.2 Concepts Guide*
- *ExtremeXOS 12.2 Command Reference Guide*
- *ExtremeXOS 12.2 Release Notes*
- *Extreme Networks BlackDiamond 8800 Series Switch Hardware Installation Guide*
- *Extreme Networks BlackDiamond 12800 Series Switch Hardware Installation Guide*
- *Extreme Networks BlackDiamond 10808 Switch Hardware Installation Guide*
- *Extreme Networks BlackDiamond 20808 Switch Hardware Installation Guide*
- *Extreme Networks Summit Family Switches Hardware Installation Guide*

Documentation for Extreme Networks products is available from the Extreme Networks website at the following location:

http://www.extremenetworks.com/services/documentation

You can select and download the following Extreme Networks documentation from the Documentation Overview page:

- Software User Guides
- Hardware User Guides

You can find archived user guides for software at:

http://www.extremenetworks.com/services/documentation/swuserguides.asp

You can find archived installation guides for hardware at:

http://www.extremenetworks.com/services/documentation/hwuserguides.asp

# 1 Extreme Networks SFP Modules

This chapter includes the following topics:


- Overview of SFP and SFP+ Modules on page 9
- Types of Optical SFP and SFP+ Interfaces on page 9
- 10/100/1000BASE-T Copper SFP Module on page 15
- Preparing to Install or Replace an SFP Module on page 15
- Installing an SFP Module on page 16
- Connecting Fiber Cables on page 17
- Removing an SFP Module on page 18


## Overview of SFP and SFP+ Modules

Extreme Networks switches support small form factor pluggable (SFP) interface modules, also known as mini-GBICs. Extreme Networks switches support both optical and copper SFP modules. The types of switches and the I/O modules determine the compatible type of SFP module.

Use only Extreme Networks-certified SFP modules, available from Extreme Networks, in the SFP port on the switch or I/O module.

## Types of Optical SFP and SFP+ Interfaces

Extreme Networks switches support the following types of optical SFP and SFP+ interfaces:

- SX SFP module (see page 10)
- LX SFP module (see page 10)
- ZX SFP module (see page 11)
- 1000BASE-BX bidirectional SFP modules (see page 12)
  - 1000BASE-BX-D
  - 1000BASE-BX-U
- 100FX SFP module for Gigabit Ethernet ports (see page 12)
- Dual-speed 100FX/1000LX SFP module (see page 12)
- LX100 SFP module (see page 13)
- 100BASE-LX10 SFP module (see page 14)
- 100BASE-BX SFP modules (see page 14)
  - 100BASE-BX-D
  - 100BASE-BX-U
- 100FX SFP module for 100-Mbps Ethernet (fast Ethernet) ports (see page 14)

- SR SFP+ (see page 14)
- LR SFP+ (see page 15)

The information in this guide about hardware platform support for each type of SFPs is current as of the date this guide was published. Support for specific SFP types may have been added to other switches or I/O modules besides those listed in this guide. For current information about hardware support and the minimum required software for SFPs, refer to the most recent version of the ExtremeXOS release notes.

Technical specifications for all SFP modules are listed in Appendix B.

# SX SFP Module

The SX SFP module provides a 1000BASE-X optical connection using LC connectors and multimode fiber cable up to 550 meters long. The SX SFP module conforms to the 1000BASE-SX standard.

SX SFP modules are supported in the following Extreme Networks switches:

- BlackDiamond 10808
- BlackDiamond 8800 series
- BlackDiamond 12800 series
- BlackDiamond 20808
- Summit X150 series
- Summit X250e series
- Summit X450 series
- Summit X450a series
- Summit X450e series
- Summit X650-24x switch: ports 1 through 22, VIM1 module ports

## Optical Budget Calculation

When you plan an installation using the SX SFP module, Extreme Networks recommends that 3 dB of the total budget be reserved for losses induced by cable splices or connectors and operating margin. There is no minimum attenuation or minimum cable length restriction.

For technical specifications for the SX SFP, see Appendix B.

# LX SFP Module

The LX SFP module provides a 1000BASE-X optical connection using LC connectors and single-mode fiber (SMF) cable up to 10 km long. The LX SFP module conforms to the 1000BASE-LX standard.

LX SFP modules are supported on the following Extreme Networks switches:

- BlackDiamond 10808
- BlackDiamond 8800 series
- BlackDiamond 12800 series
- BlackDiamond 20808
- Summit X150 series

- Summit X250e series
- Summit X450 series
- Summit X450a series
- Summit X450e series
- Summit X650-24x switch: ports 1 through 22, VIM1 module ports

### Optical Budget Calculation

Measure cable plant losses with a 1310 nm light source and verify this to be within budget. When you calculate the maximum distance attainable using optical cable with a specified loss per kilometer (for example 0.25 dB/km), Extreme Networks recommends that 3 dB of the total budget be reserved for losses induced by cable splices or connectors, and operating margin. There is no minimum system budget or minimum cable length restriction because the maximum receive power is the same as the maximum transmit power. There is no minimum attenuation or minimum cable length restriction.

For technical specifications for the LX SFP, see Appendix B.

## ZX SFP Module

The ZX SFP module is a long-haul SFP that provides a 1000BASE-X optical connection using LC connectors and SMF cable up to 80 km long.

ZX SFP modules are supported on the following Extreme Networks switches:

- BlackDiamond 10808
- BlackDiamond 8800 series
- BlackDiamond 12800 series
- BlackDiamond 20808
- Summit X150 series
- Summit X250e series
- Summit X450 series
- Summit X450a series
- Summit X450e series
- Summit X650-24x switch: ports 1 through 22, VIM1 module ports

### Optical Budget Calculation

Measure cable plant losses with a 1550 nm light source and verify this to be within budget. When you calculate the maximum distance attainable using optical cable with a specified loss per kilometer (for example, 0.25 dB/km), Extreme Networks recommends that you reserve 3 dB of the total budget for losses induced by cable splices or connectors and operating margin. A minimum system budget or attenuation is required to prevent saturation of the receiver.

For technical specifications for the ZX SFP, see Appendix B.

## 1000BASE-BX Bi-Directional SFP Modules

The 1000BASE-BX SFP modules include the 1000BASE-BX-U SFP module and the 1000BASE-BX-D SFP module. These two SFP modules are used together to permit a bidirectional Gigabit Ethernet connection using a single strand of SMF cable and LC connectors. The 1000BASE-BX-D SFP operates at wavelengths of 1490 nm TX/1310 nm RX, and the 1000BASE-BX-U SFP operates at wavelengths of 1310 nm TX/1490 nm RX. The 1000BASE-BX-U SFP module is always connected to the 1000BASE-BX-D SFP module. The maximum transmission distance for this connection is 10 km. The 1000BASE-BX SFP modules conform to the IEEE 802.3ah 1000BASE-BX10 standard.

The 1000BASE-BX SFP modules are supported on the following Extreme Networks switches:

- BlackDiamond 10808
- BlackDiamond 8800 series
- BlackDiamond 12800 series
- BlackDiamond 20808
- Summit X150 series
- Summit X250e series
- Summit X450 series
- Summit X450a series
- Summit X450e series
- Summit X650-24x switch: ports 1 through 22, VIM1 module ports

For technical specifications for the 1000BASE-BX SFP, see Appendix B.

## 100FX SFP Module for Gigabit Ethernet Ports

The 100FX SFP module for Gigabit Ethernet (GE) ports (Model # 10063) provides optical links up to 2 km long using multimode fiber cable. The 100FX SFP for GE ports conforms to the 100FX-MMF standard.

The 100FX SFP modules are supported in the following Extreme Networks switches:

- BlackDiamond 8800 series
  - G24x I/O module
  - MSM-G8x module
  - G48Xa I/O module
- BlackDiamond 20808
- Summit X450-24x switch: ports 5 through 24 (not supported on combination ports)
- Summit X450a-24x, X450a-24xDC switches: ports 1 through 20 (not supported on combination ports)

For technical specifications for the 100FX SFP for Gigabit Ethernet ports, see Appendix B.

## Dual-speed 100FX/1000LX SFP Module

The dual-speed 100FX/1000LX SFP module operates at either 100 Mbps or 1000 Mbps over SMF links up to 10 km long. Operating at 100 Mbps, the dual-speed SFP conforms to the 100BASE-LX standard. Operating at 1000 Mbps, the dual-speed SFP conforms to the 1000BASE-LX standard.

The dual-speed 100FX/1000FX SFP modules are supported in the following Extreme Networks switches:

- BlackDiamond 8800 series
- BlackDiamond 12800 series
- BlackDiamond 20808
- Summit X450-24x switch: ports 5 through 24 (not supported on combination ports)
- Summit X450a-24x, X450a-24xDC switches: ports 1 through 20 (not supported on combination ports)

### Optical Budget Calculation

The 100FX/1000LX SFP module complies with the 100FX-SMF standard. To use the 100FX/1000LX SFP module in 100FX-MMF operation, a minimum attenuation of 6 dB is required. After the SFP module is installed, connect a 6-dB attenuator to the transmitter side (Tx) of the SFP module. Next, connect the attenuator to the single-mode end of a mode conditioning patch cord. The mode conditioning patch cord transitions the SFP module from SMF to MMF operation.

When in SMF operation, 100FX-SMF or 1000LX, measure cable plant losses with a 1310 nm light source and verify this to be within budget. When you calculate the maximum distance attainable using optical cable with a specified loss per kilometer (for example 0.25 dB/km), Extreme Networks recommends that 3 dB of the total budget be reserved for losses induced by cable splices or connectors and operating margin.

**NOTE**

*The 100FX/1000LX SFP module detects link status based only on the presence of light in the receive cable. Therefore, if a single strand is broken, the link partner on the other port will not detect link down.*

For technical specifications for the 100FX/1000LX SFP, see Appendix B.

## LX100 SFP Module

The LX100 SFP module provides a 1000BASE-X optical link up to 100 km long using LC connectors and SMF cable.

The LX-100 SFP modules are supported on the following Extreme Networks switches:

- BlackDiamond 8800 series
- BlackDiamond 10808
- BlackDiamond 12800 series
- BlackDiamond 20808
- Summit X150 series
- Summit X250e series
- Summit X450 series
- Summit X450a series
- Summit X450e series
- Summit X650-24x switch: ports 1 through 22, VIM1 module ports

For technical specifications for the LX100 SFP, see Appendix B.

## 100BASE-LX10 SFP Module

The 100BASE-LX10 SFP module provides a 100-Mbps optical connection using LC connectors and SMF cable. The maximum transmission distance for this connection is 10 km.

The LX10 SFP module is supported in the following Extreme Networks switches:

- Summit X250e series: all ports
- Summit X150 series: combination ports only

For technical specifications for the 100BASE-LX10 SFP, see Appendix B.

## 100BASE-BX Bi-Directional SFP Modules

The 100BASE-BX SFP modules include the 100BASE-BX-U SFP module and the 100BASE-BX-D SFP module. These two SFP module are used together in a Summit family switch to permit a bidirectional 100-Mbps Ethernet connection using a single strand of SMF cable and LC connectors. The 100BASE-BX-U SFP module is always connected to the 100BASE-BX-D SFP module. The 100BASE-BX-D SFP operates at wavelengths of 1550-nm TX/1310-nm RX wavelength), and the 1000BASE-BX-U SFP operates at wavelengths of 1310 nm TX/1550 nm RX. The maximum transmission distance for this connection is 10 km. The 100BASE-BX SFP modules conform to the IEEE 802.3ah standard.

The 100BASE-BX SFP modules are supported in the following Extreme Networks switches:

- Summit X250e series: all ports
- Summit X150 series: combination ports only

For technical specifications for the 100BASE-BX bi-directional SFP, see Appendix B.

## 100FX SFP Module for Fast Ethernet Ports

The 100FX SFP module for fast Ethernet (FE) ports (Model # 10067) provides a 100-Mbps optical link using LC connectors and 1310-nm multimode fiber (MMF) cable. The maximum transmission distance for this connection is 2 km.

The 100FX SFP module for FE ports is supported in the following Extreme Networks switches:

- Summit X250e series switches: all ports
- Summit X150 series switches: combination ports only

For technical specifications for the 100FX SFP module for fast Ethernet ports, see Appendix B.

## SR SFP+ Module

The SR SFP+ module provides a 10-Gbps optical connection using LC connectors and multimode fiber cable up to 300 meters long. The SR SFP+ module conforms to the 10GBASE-SR standard.

The SR SFP+ module is supported in the following Extreme Networks switches and modules:

- Summit X650-24x switch
- VIM1-10G8X versatile interface module for the Summit X650 series switches
- XGM2-2sf option card in the Summit X350, X450a, and X450e series switches

For technical specifications for the SR SFP+, see Appendix B.

## LR SFP+ Module

The LR SFP+ module provides a 10-Gbps optical connection using LC connectors and single-mode fiber cable up to 10 kilometers long. The LR SFP+ module conforms to the 10GBASE-LR standard.

The LR SFP+ module is supported in the following Extreme Networks switches:

- Summit X650-24x switch (ports 1 through 24 on the front panel)
- VIM1-10G8X versatile interface module for the Summit X650 series switches
- XGM2-2sf option card in the Summit X350, X450a, and X450e series switches

For technical specifications for the LR SFP+, see Appendix B.

# 10/100/1000BASE-T Copper SFP Module

The Extreme Networks 10/100/1000BASE-T copper SFP module is compatible with the Gigabit Ethernet standard and 1000 Base-T standard as specified in the IEEE 802.3ab standard. This SFP module provides a 100-Mbps connection using Category 5 cable.

The 10/100/1000BASE-T SFP module is supported in the following Extreme Networks switches:

- BlackDiamond 8800 series
- BlackDiamond 8800 series
- Summit X450 series (not supported on combination ports)
- Summit X450a series (not supported on combination ports)
- Summit X450e series (not supported on combination ports)

For technical specifications for the 10/100/1000BASE-T copper SFP, see Appendix B.

# Preparing to Install or Replace an SFP Module

Complete the following tasks before inserting the SFP module:

1. Inspect and clean the fiber tips, coupler, and connectors.
2. Prepare and clean an external attenuator, if needed.

When handling fiber cables, take the following precautions to prevent damage to the cables:

- Do not stretch the fiber.
- Make sure the bend radius of the fiber is not less than 2 inches (5.08 cm).

Extreme Networks recommends the following guidelines when installing or replacing SFP modules on an active network:

- Use the same type of SFP module at each end of the link, except for the 1000BASE-BX and 100BSE-BX bi-directional SFP modules. The bi-directional SFP modules include a D-type and a U-type. You must use one D-type SFP and one U-type SFP together to allow for a single fiber bidirectional connection.
- Connect one end of the link to the Tx port. Without an attenuator, measure the total loss from the Tx port to the other site of the link. The total loss must not exceed the total optical system budget.

# Installing an SFP Module

You can add or remove SFP modules in your switch without powering off the system. Figure 1 and Figure 2 show the types of SFP modules and connectors.

**NOTE**

*The bi-directional SFP modules combine two SFP optical devices that must be used as a pair to establish the bidirectional connection over a single fiber. Module C and Module D in Figure 1 show the pair of SFPs for a bi-directional SFP module.*

**WARNING!**

*Optical SFPs contain Class 1 lasers. Invisible laser radiation can occur when laser connections are unplugged. Do not stare into the beam. This device is compliant with FCC 21 CFR 1040.10 and EN60825-1 A2:2001.*

**Figure 1: Optical SFP Module Types and Connectors**

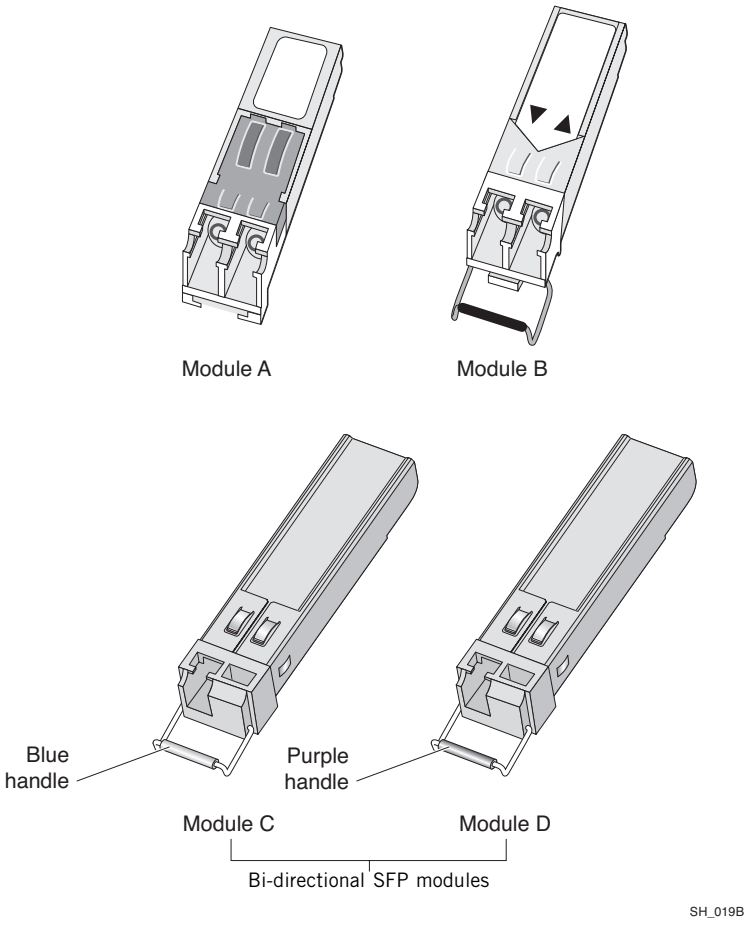
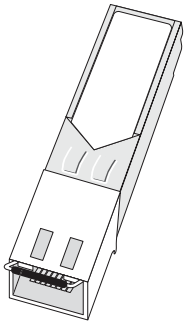


**Figure 2: Copper SFP Module**



BD_172

**CAUTION**

*To prevent ESD damage to an SFP module, always use an appropriately grounded ESD-preventive wrist strap when installing or removing the module. Handle the module by its sides only. Never touch the card-edge connectors at the insertion end of the module.*

To insert an SFP module:

1 Holding the SFP module by its sides, insert the SFP module into the port on the switch.

2 Slide the SFP module into the port until you hear it click. If the SFP module has a handle, push up on the handle to secure the SFP module.

**NOTE**

*Disconnect fiber-optic cable from an optical SFP module before removing the SFP module from the port.*

# Connecting Fiber Cables

Before you connect fiber cables to the dual-speed 100FX/1000LX SFP module or the LX100 SFP module, note the following information about these SFP modules.

## 100FX/1000LX SFP Module

The 100FX/1000LX SFP module complies with the 100FX-SMF standard. In order to use the 100FX/1000LX SFP module in 100FX-MMF operation, a minimum attenuation of 6 dB is required. After the SFP module is installed, connect a 6-dB attenuator to the transmitter side (Tx) of the SFP module. Then connect the attenuator to the single-mode end of a mode conditioning patch cord. The mode conditioning patch cord transitions the SFP module from SMF to MMF operation.

## LX100 SFP Module

To prevent permanent damage to the LX100 SFP module, always check the optical input power of the receiver before you insert the fiber cable. The maximum optical input power is -9 dBm. If you use an

optical loopback for diagnostics, the loopback requires a minimum of 12 dB optical attenuation. The recommended attenuation range is 12 to 20 dB.

# Removing an SFP Module

To remove an SFP module:

1 Disconnect the optical cable from the SFP module.

2 Unlatch the SFP module in one of the following ways:

- On an SFP module similar to Module A in Figure 1, press and hold the black plastic tab at the bottom of the connector.
- On an SFP module similar to Module B, Module C, or Module D in Figure 1, rotate the front handle down.

3 Pull the SFP module out of the port on the switch.

# 2 Extreme Networks XFP Modules

This chapter includes the following topics:


- Overview of XFP Modules on page 19
- Installing an XFP Module on page 20
- Removing an XFP Module on page 22


This chapter describes XFP modules used for Extreme Networks switches and provides installation instructions for the modules.

## Overview of XFP Modules

XFP modules are 10-gigabit modules that convert serial electrical signals to external serial optical or electrical signals. They are used in the following Extreme Networks switches:

- Summit X450a and X450e series switches
- BlackDiamond 10G4Xa, 10G4Xc, and 10G8Xc I/O modules for the BlackDiamond 8800 series switches
- BlackDiamond GM-40XA and GM-40XB I/O modules for the BlackDiamond 20808 switch

XFP modules can be installed or replaced in an Extreme Networks switch or I/O module without powering off the system. All Extreme Networks XFP modules comply with IEEE 802.3ae standards and with the latest XFP multi-source agreement (MSA).

Extreme Networks switches and modules support the following types of XFP modules:

- LR XFP module

  The LR XFP module uses single-mode fiber (SMF) cable for links up to 10 km long. It has an LC duplex connector.
- SR XFP module

  The SR XFP module uses multimode fiber (MMF) cable for links up to 300 m long. It has an LC duplex connector.
- ER XFP module

  The ER XFP module uses SMF cable for links up to 40 km long. It has an LC duplex connector.
- ZR XFP modules

  The ZR XFP module uses SMF cable for links up to 80 km long. It has an LC duplex connector.
- DWDM XFP modules

  The DWDM XFP module uses SMF cable for links up to 80 km long. It has an LC duplex connector.

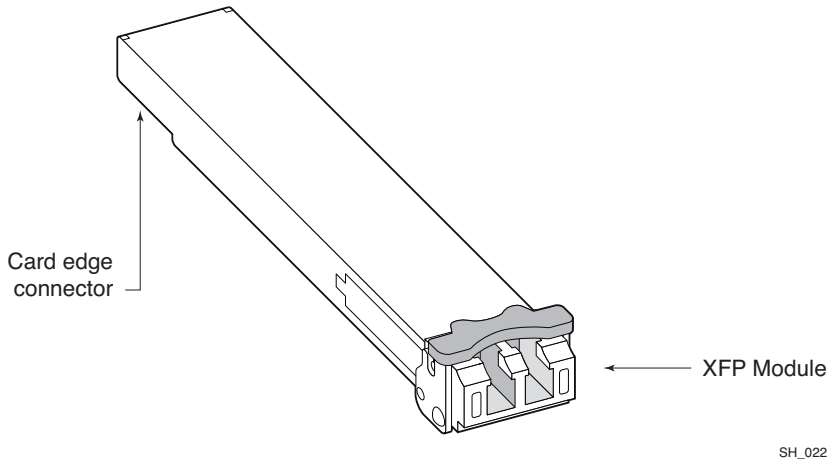
For current information about hardware support for XFPs, refer to the most recent version of the ExtremeXOS release notes.

Technical specifications for XFP modules are listed in Appendix B.

# Installing an XFP Module

This section describes how to install an XFP module (Figure 3). You can install or remove an XFP module in your Extreme Networks switch without powering off the system.

**Figure 3: XFP Module**




**WARNING!**

*XFP modules contain Class 1 lasers. Invisible laser radiation can occur when laser connections are unplugged. Do not stare into the beam. This device is compliant with FCC 21 CFR 1040.10 and EN60825-1 A2:2001.*

**CAUTION**

*To prevent ESD damage to the XFP module, always use an appropriately grounded ESD-preventive wrist strap when installing or removing the module. Handle the module by its sides only. Never touch the card-edge connectors at the insertion end of the module.*

To install an XFP module:

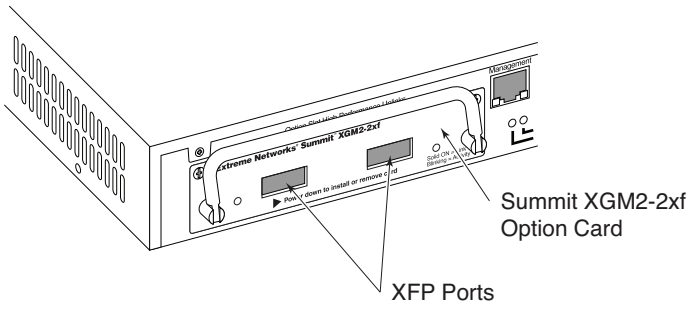
1 Remove the XFP module from its antistatic container and remove the dust covers from the module optical connectors.

If your module has a protective pad covering the card-edge connector, remove it. Store the antistatic container, dust covers, and card-edge connector protective pad in a clean location from which they can be easily retrieved if you need to uninstall the module.

2 Remove any rubber dust covers from the port on the module into which you are installing the XFP module.

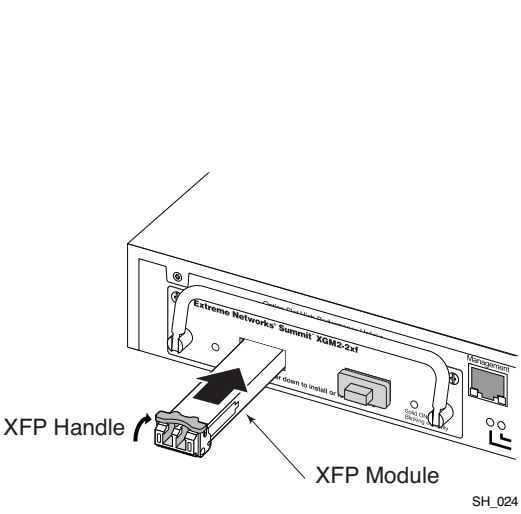
On the Summit XGM2-2xf option card, move the handle to an upright position to access the XFP ports (see Figure 4).

**Figure 4: Accessing the XFP Ports**

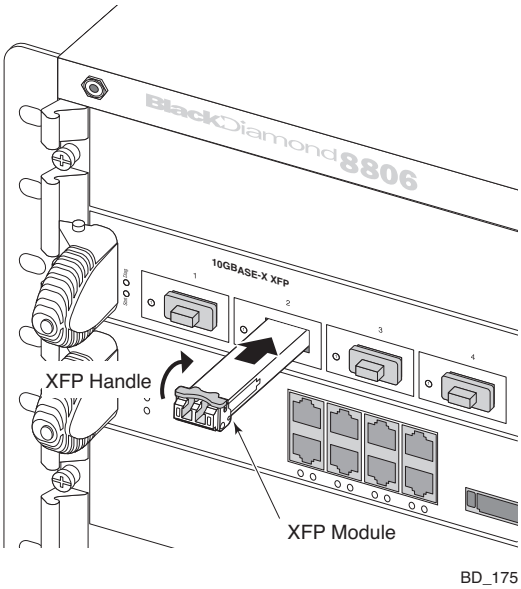



3 Holding the module by its sides, partially insert the XFP module into one of the ports on the Summit XGM2-2xf option card or the BlackDiamond module (see Figure 5).

**Figure 5: Installing an XFP Module**




Summit switch

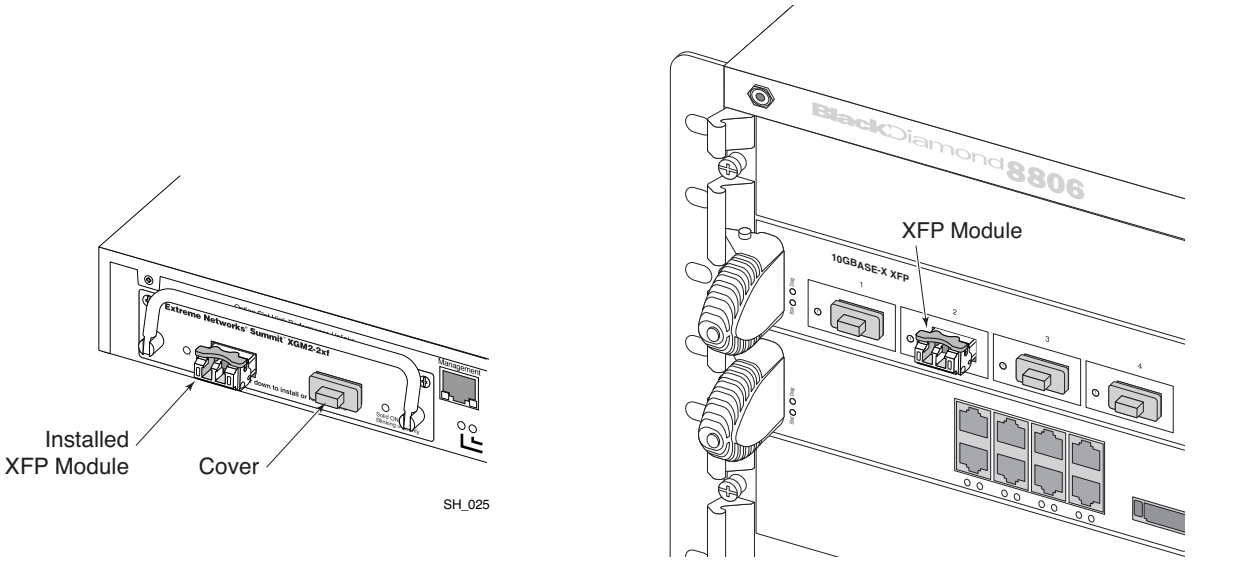



BlackDiamond switch

4 Push the XFP handle (bail latch) upward until it clicks into place (see Figure 5).

5 Slide the XFP module as far as possible into the slot until you hear it click, indicating that it is firmly attached (see Figure 5 and Figure 6).

**Figure 6: Installed XFP Module**




6 If you are installing only one XFP module, make sure that all unoccupied ports are covered with a rubber dust cover, which is shipped with the option card (see Figure 6).

**NOTE**

*To prevent permanent damage to a ZR XFP or DWDM XFP, always check the optical input power of the receiver before inserting the fiber cable. The maximum optical input power for these XFPs is –7 dBm. If you use an optical loopback for diagnostics, the loopback requires a minimum of 15 dB optical attenuation. The recommended attenuation range is 15 to 20 dB.*

**NOTE**

*To ensure that your XFP module is undamaged upon installation, you can correlate factory test data with your installation site test data by consulting the average power reference values shown on the XFP module test data sheet (Part No. 121080-00) enclosed with the module.*

# Removing an XFP Module

This section describes how to remove an XFP module. You can remove an XFP module from your Extreme Networks switch or I/O module without powering off the system. The XFP module is shown in Figure 3 on page 20.

To remove an XFP module:

1. Release the handle (bail latch) on the XFP module.
2. Carefully pull the XFP module out of the port.
3. Place the dust covers back into the XFP module connectors.
4. Place the XFP module immediately into an antistatic container to protect it from ESD damage and dust.

# 3 Extreme Networks XENPAK Transceivers

This chapter provides important safety information and installation instructions for the XENPAK optical transceiver modules used in Extreme Networks equipment.

This chapter includes the following topics:


- Overview of XENPAK Modules on page 25
- Installing and Removing a XENPAK Module on page 29


## Overview of XENPAK Modules

The BlackDiamond 8800 series of switches, the BlackDiamond 10808 switch, the BlackDiamond 12800 series of switches, and the Summit family of switches support several types of XENPAK transceiver modules. All of these modules conform to the 10 Gigabit Ethernet standard defined by the IEEE 802.3ae as applicable

**CAUTION**

*XENPAK modules contain Class 1 laser devices. Invisible laser radiation can occur when the connectors are open. Do not stare into the beam. This device is compliant with FCC 21 CFR 1040.10, 1040.11 and EN60825-1 A2:2001.*

Extreme Networks switches and modules support the following types of XENPAK interfaces:


- SR XENPAK on page 26
- LR XENPAK on page 26
- ER XENPAK on page 27
- ZR XENPAK on page 27
- LX4 XENPAK on page 28
- LW XENPAK on page 28


**NOTE**

*CX4 XENPAKs are also supported by Extreme Networks devices; contact your vendor to obtain these.*

**NOTE**

*Use only Extreme Networks-approved XENPAK modules in all Extreme Networks devices.*

# SR XENPAK

The SR XENPAK supports multimode fiber (MMF) and has SC connectors.

The SR XENPAK requires the software versions listed in Table 3.

**Table 3: SR XENPAK Software Requirements**

| Switch Model | Required Software |
|---|---|
| **BlackDiamond Switches** | |
| BlackDiamond 10808 | ExtremeXOS 11.1.1 or later |
| BlackDiamond 8800 series | ExtremeXOS 11.1.1 or later |
| BlackDiamond 12804 | ExtremeXOS 11.4 or later |
| BlackDiamond 12802 | ExtremeXOS 12.0 or later |
| **Summit Switches** | |
| Summit X450 series | ExtremeXOS 11.2.0 or later |
| Summit X450a series | ExtremeXOS 11.2.0 or later |
| Summit X450e series | ExtremeXOS 11.2.0 or later |

For technical specifications for the SR XENPAK, see Appendix B.

# LR XENPAK

The LR XENPAK supports single-mode fiber (SMF) and has SC connectors.

The LR XENPAK requires the software versions listed in Table 4.

**Table 4: LR XENPAK Software Requirements**

| Switch Model | Required Software |
|---|---|
| **BlackDiamond Switches** | |
| BlackDiamond 10808 | ExtremeXOS 11.1.1 or later |
| BlackDiamond 8800 series | ExtremeXOS 11.1.1 or later |
| BlackDiamond 12804 | ExtremeXOS 11.4 or later |
| BlackDiamond 12802 | ExtremeXOS 12.0 or later |
| **Summit Switches** | |
| Summit X450 series | ExtremeXOS 11.2.0 or later |
| Summit X450a series | ExtremeXOS 11.2.0 or later |
| Summit X450e series | ExtremeXOS 11.2.0 or later |

For technical specifications for the LR XENPAK, see Appendix B

# ER XENPAK

The ER XENPAK supports SMF and has SC connectors.

The ER XENPAK requires the software versions listed in Table 5.

**Table 5: ER XENPAK Software Requirements**

| Switch Model | Required Software |
|---|---|
| **BlackDiamond Switches** | |
| BlackDiamond 10808 | ExtremeXOS 11.1.1 or later |
| BlackDiamond 8800 series | ExtremeXOS 11.1.1 or later |
| BlackDiamond 12804 | ExtremeXOS 11.4 or later |
| BlackDiamond 12802 | ExtremeXOS 12.0 or later |
| **Summit Switches** | |
| Summit X450 series | ExtremeXOS 11.2.0 or later |
| Summit X450a series | ExtremeXOS 11.2.0 or later |
| Summit X450e series | ExtremeXOS 11.2.0 or later |

For technical specifications for the ER XENPAK, see Appendix B.

# ZR XENPAK

The ZR XENPAK supports SMF and has SC connectors.

The ZR XENPAK requires the software versions listed in Table 6.

**Table 6: ZR XENPAK Software Requirements**

| Switch Model | Required Software |
|---|---|
| **BlackDiamond Switches** | |
| BlackDiamond 10808 | ExtremeXOS 11.3.1 or later |
| BlackDiamond 8800 series | ExtremeXOS 11.3.1 or later |
| BlackDiamond 12804 | ExtremeXOS 11.4 or later |
| BlackDiamond 12802 | ExtremeXOS 12.0 or later |
| **Summit Switches** | |
| Summit X450 series | ExtremeXOS 11.3.1 or later |
| Summit X450a series | ExtremeXOS 11.3.1 or later |
| Summit X450e series | ExtremeXOS 11.3.1 or later |

For technical specifications for the ZR XENPAK, see Appendix B.

**WARNING!**

*To prevent permanent damage to the ZR XENPAK and other equipment: always check the optical input power of the receiver before inserting the fiber. The maximum optical input power for the receiver is -7 dBm. If you use optical loopback for diagnostics purposes, the loopback requires a minimum of 10 dB optical attenuation. The recommended attenuation range is 10 dB to 15 dB.*

# LX4 XENPAK

The LX4 XENPAK supports multimode fiber (MMF) in intra-building connections and single-mode fiber (SMF) for interbuilding connections. The LX4 XENPAK has SC connectors.

The LX4 XENPAK requires the software versions listed in Table 7.

**Table 7: LX4 XENPAK Software Requirements**

| Switch Model | Required Software |
|---|---|
| **BlackDiamond Switches** | |
| BlackDiamond 10808 | ExtremeXOS 11.3.1 or later |
| BlackDiamond 8800 series | ExtremeXOS 11.3.1 or later |
| BlackDiamond 12804 | ExtremeXOS 11.4 or later |
| BlackDiamond 12802 | ExtremeXOS 12.0 or later |
| **Summit Switches** | |
| Summit X450 series | ExtremeXOS 11.3.1 or later |
| Summit X450a series | ExtremeXOS 11.3.1 or later |
| Summit X450e series | ExtremeXOS 11.3.1 or later |

For technical specifications for the LX4 XENPAK, see Appendix B.

# LW XENPAK

To recognize the LW XENPAK module, your Extreme Networks switch must have the minimum software release listed in Table 8.

**Table 8: LW XENPAK Software Requirements**

| Switch Model | Required Software Release |
|---|---|
| **BlackDiamond Switches** | |
| BlackDiamond 10808 | ExtremeXOS 11.4.1 or later |
| BlackDiamond 12804 | ExtremeXOS 11.4.1 or later |
| BlackDiamond 12802 | ExtremeXOS 12.0 or later |
| **Summit Switches** | |
| Summit X450a | ExtremeXOS 11.5.0 or later |
| Summit X450e | ExtremeXOS 11.5.0 or later |

**NOTE**

*BlackDiamond 10808 switches and BlackDiamond 12804 switches running software earlier than ExtremeXOS 11.4.2.3 do not support jumbo-size frame for the LW XENPAK. These switches support only standard-size frame for the LW XENPAK.*

*BlackDiamond 10808 switches and BlackDiamond 12804 switches running the latest version of ExtremeXOS 11.4 support jumbo-size frame for the LW XENPAK with a 5% decrease in performance, allowing for 95% of the maximum WAN PHY traffic.*

*ExtremeXOS 11.5.0 or later supports the LW XENPAK at full functionality with 100% performance in the Summit X450a and X450e series switches.*

**CAUTION**

*The maximum input power (average receive power) should be less than 0.5 dBm.*

For technical specifications for the LW XENPAK, see Appendix B.

### Transmitter Clock Locking Mode

The LW XENPAK module provides an interface connection between a 10-gigabit Ethernet and a 10-gigabit SONET/SDH network from a 10-gigabit Ethernet equipment port.

The default transmitter clock locking mode of the LW XENPAK module is set to line timing mode. When in line timing mode, the LW XENPAK module transmitter clock is locked to the receiver-recovered clock. When the LW XENPAK is connected to the SONET/SDH network on the other side of optical cable, the LW XENPAK transmitter clock synchronizes with the SONET/SDH clock source, which helps reduce the pointer adjustment between the SONET/SDH network and the LW XENPAK.

To prevent a clock reference loop, be sure that only one end of a link is using line timing mode and to use internal timing when testing with an optical loopback cable.

## Installing and Removing a XENPAK Module

**WARNING!**

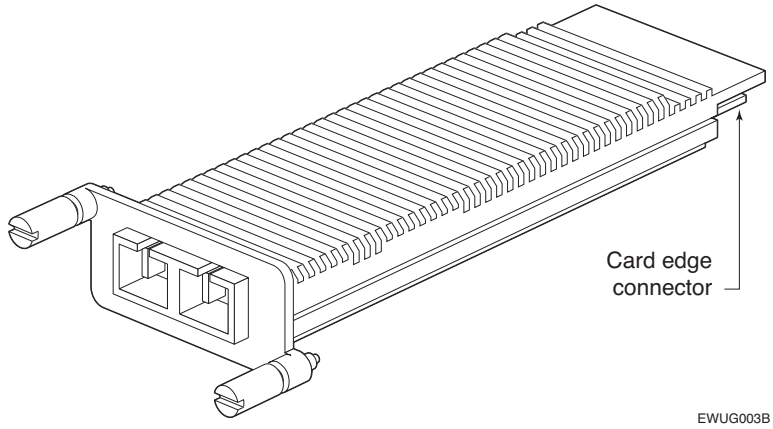
*XENPAK modules become very hot after prolonged use. Be careful when removing a XENPAK module from the chassis or option card. If the XENPAK module is too hot to touch, disengage the XENPAK module and allow it to cool before removing it completely.*

This section describes installing and removing the XENPAK module (Figure 7). You can install or remove the XENPAK module from your Extreme Networks switch without powering off the system.

**NOTE**

*On a Summit X450 series, X450a series, or X450e series switch, the XENPAK module is inserted into an optional module card. Although the module card is not hot-swappable, you can hot swap the XENPAK into and out of the module card on the Summit. For information about the optional module card for XENPAKs on a Summit X450 series, X450a series, or X450e series switch, see the* Summit Family Switches Hardware Installation Guide.

**Figure 7: XENPAK Module**




**WARNING!**

*XENPAK modules contain Class 1 lasers. Invisible laser radiation can occur when laser connections are unplugged. Do not stare into the beam. This device is compliant with FCC 21 CFR 1040.10 and EN60825-1 A2:2001.*

**CAUTION**

*To prevent ESD damage to the XENPAK module, always use an appropriately grounded ESD-preventive wrist strap when installing or removing the module. Handle the module by its sides only. Never touch the card-edge connectors at the insertion end of the module.*

## Installing a XENPAK Module

To install a XENPAK module:

1. Remove the XENPAK module from its antistatic container and remove the dust covers from the module optical connectors.

   If your module has a protective pad covering the card-edge connector, remove it. Store the antistatic container, dust covers, and card-edge connector protective pad in a clean location from which they can be easily retrieved if you need to uninstall the module.
2. Remove any dust covers from the port on the module into which you are installing the XENPAK module.
3. Holding the module by its sides, insert the XENPAK module into the slot on the I/O module or Summit option card.
4. Slide the XENPAK module as far back into the slot as possible, until you hear it click, indicating that it is firmly attached.
5. Secure the XENPAK module to the I/O module or option card by turning the two captive screws clockwise until the screws are hand-tight.

**NOTE**

*To ensure that your XENPAK module is undamaged upon installation, you can correlate factory test data with your installation site test data by consulting the average power reference values shown on the XENPAK module test data sheet (Part No. 121074-00) enclosed with your module.*

# Removing a XENPAK Module

To remove a XENPAK module:

1 Disconnect the optical cable from the XENPAK module.

**WARNING!**

*XENPAK modules contain Class 1 lasers. Invisible laser radiation can occur when laser connections are unplugged. Do not stare into the beam.*

2 Loosen the two captive screws until they are completely free from the I/O module faceplate or the Summit option card. (The captive screws remain attached to the XENPAK module.)

3 Gripping both captive screws, carefully pull the XENPAK module out of the slot.

4 Place the dust covers back into the XENPAK module connectors.

5 Place the XENPAK module immediately into an antistatic container to protect it from ESD damage and dust.

# A Safety Information

**WARNING!**

*Read the following safety information thoroughly before installing Extreme Networks products. Failure to follow this safety information can lead to personal injury or damage to the equipment.*

Only trained service personnel should perform service to Extreme Networks switches and their components. Trained service personnel have read all related installation manuals, have the technical training and experience necessary to be aware of the hazards to which they are exposed in performing a task, and are aware of measures to minimize the danger to themselves or other persons.

## Fiber Optic Ports—Optical Safety

The following safety warnings apply to all optical devices used in Extreme Networks equipment that are removable or directly installed in an I/O module or chassis system. These devices include, but are not limited to, the following devices:

- SC gigabit interface converters (GBICs)
- SFP GBICs (mini-GBICs)
- XENPAKs
- XFP laser optic modules

**CAUTION**

*Laser optic modules become very hot after prolonged use. Take care when removing a laser optic module from the chassis or option card. If the laser optic module is too hot to touch, disengage the laser optic module and allow it to cool before removing it completely.*

**WARNING!**

*When working with laser optic modules, always take the following precautions to prevent exposure to hazardous radiation:*

- *Never look at the transmit LED/laser through a magnifying device while it is powered on.*
- *Never look directly at a fiber port on the switch or at the ends of a fiber cable when they are powered on.*
- *Invisible laser radiation can occur when the connectors are open. Avoid direct eye exposure to the beam when optical connections are unplugged.*
- *Never alter, modify, or change an optical device in any way other than suggested in this document.*

## GBIC, Mini-GBIC, XENPAK, and XFP Regulatory Compliance

- Class 1 Laser Product
- EN60825-1+A2:2001 or later, European laser standard
- FCC 21 CFR Chapter 1, Subchapter J in accordance with FDA & CDRH requirements
- Application of CE Mark in accordance with 89/336/EEC EMC and 73/23/EEC Low Voltage Directives
- UL and/or CSA registered component for North America
- 47 CFR Part 15, Class A when installed into Extreme products

## Using Third-Party Optical Modules

Extreme Networks optical modules are tested to work in all supported Extreme Networks switches. We recommend that all customers use Extreme Networks optical modules in their Extreme Networks switches. Extreme Networks assumes no liability for third-party optical modules. Although Extreme Networks does not block third-party optical modules, we cannot ensure that all third-party optical modules operate properly in all Extreme Networks switches. The customer assumes all risks associated with using third-party optical modules in Extreme Networks switches.

# Sicherheitshinweise

**WARNUNG!**

*Vor der Installation der Produkte von Extreme Networks sind die nachfolgenden Sicherheitshinweise aufmerksam zu lesen. Die Nichtbeachtung dieser Sicherheitshinweise kann zu Verletzungen oder Schäden an der Ausrüstung führen.*

Installation, Wartung und Ausbau eines Switch, einer Grundplatte oder einer seiner Komponenten dürfen nur von geschultem und qualifiziertem Servicepersonal durchgeführt werden! Geschulte und qualifizierte Servicetechniker verfügen über die erforderliche technische Ausbildung und Erfahrung, um mögliche Gefahren bei der Durchführung von Servicearbeiten zu erkennen und Maßnahmen zur Minimierung der Gefahr für sich bzw. andere zu treffen.

# Lichtleiteranschlüsse: Optische Sicherheit

**WARNUNG!**

*Beim Umgang mit Lichtleitermodulen sind folgende Vorsichtsmaßnahmen zu beachten:*

- *Niemals durch ein Vergrößerungsgerät auf die übertragende LED/den Laser schauen, wenn diese(r) eingeschaltet ist.*
- *Niemals direkt auf einen Lichtleiteranschluss am Switch oder auf die Enden eines Faserkabels schauen, wenn diese eingeschaltet sind.*
- *Bei offenen Anschlüssen kann es zu unsichtbarer Laserstrahlung kommen. Direkter Augenkontakt mit dem Strahl ist zu vermeiden.*
- *Ein optisches Gerät niemals auf andere Weise verändern oder modifizieren als in diesem Dokument angegeben.*

## Einhaltung behördlicher Vorschriften durch GBIC, Mini-GBIC, XENPAK und XFP

- Laserprodukt der Klasse 1
- EN60825-1+A2:2001 oder jünger, Europäische Richtlinie für Lasersysteme
- Anwendung der CE-Kennzeichnung gemäß der Richtlinien 89/336/EWG EMV und 73/23/EWG für Niederspannungsgeräte

# B Technical Specifications

This appendix includes the following technical specifications:


- SFP and SFP+ Specifications on page 37
- XFP Specifications on page 43
- XENPAK Specifications on page 46
- Pluggable Interface Module Regulatory Compliance on page 49


## SFP and SFP+ Specifications

The SX SFP conforms to the 1000BASE-SX standard. Table 9 lists the specifications for the SX SFP interface.

**Table 9: SX SFP Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | -9.5 dBm | | -4 dBm |
| Center wavelength | 830 nm | 850 nm | 860 nm |
| **Receiver** | | | |
| Receive sensitivity | | | -17 dBm |
| Average receive power (max) | | | 0 dBm |
| Operating wavelength | 770 nm | 850 nm | 860 nm |
| **Link** | | | |
| Link power budget | | | 7.5 dB |

The LX SFP conforms to the 1000BASE-LX standard. Table 10 lists the specifications for the LX SFP interface.

**Table 10: LX SFP Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | -9.5 dBm | | -3 dBm |
| Center wavelength | 1270 nm | 1310 nm | 1355 nm |
| **Receiver** | | | |
| Receive sensitivity | | | -19 dBm |
| Average receive power (max) | | | -3 dBm |
| Operating wavelength | 1270 nm | 1310 nm | 1355 nm |
| **Link** | | | |
| Link power budget | | | 8 dB |

Table 11 lists the specifications for the ZX SFP interface.

**Table 11: ZX SFP Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | -2 dBm | 0 dBm | 3 dBm |
| Center wavelength | 1530 nm | 1550 nm | 1570 nm |
| **Receiver** | | | |
| Receive sensitivity | | | -24 dBm |
| Average receive power (max) | | | -3 dBm |
| Operating wavelength | 1530 nm | 1550 nm | 1570 nm |

Table 12 lists specifications for the 1000BASE-BX bi-directional SFPs. The 1000BASE-BX SFP modules conform to the IEEE 802.3ah 1000BASE-BX10 standard.

**Table 12: 1000BASE-BX Bi-directional SFP Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | -9 dBm | | -3 dBm |
| Center wavelength (1000BASE-BX10-D) | 1480 nm | 1490 nm | 1550 nm |
| Center wavelength (1000BASE-BX10-U) | 1260 nm | 1310 nm | 1360 nm |
| **Receiver** | | | |
| Receive sensitivity | | | -19 dBm |
| Average receive power (max) | | | -3 dBm |
| **Link** | | | |
| Link power budget | | | 8 dB |

**NOTE**

*The 1000BX bidirectional SFPs include two SFP optical devices, the 1000BASE-BX-U SFP and the 1000BASE-BX-D SFP, which must be used as a pair to allow for a single fiber bidirectional connection.*

Table 13 lists the specifications for the 100FX SFP module for Gigabit Ethernet (GE) ports. The 100FX SFP for GE ports conforms to the 100FX-MMF standard.

**Table 13: 100FX SFP (GE Ports) Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | -20 dBm | | -14 dBm |
| Center wavelength | 1270 nm | 1310 nm | 1380 nm |
| **Receiver** | | | |
| Receive sensitivity | | | -31 dBm |
| Average receive power (max) | | | -14 dBm |
| **Distance range over each fiber type** | | | |
| 62.5/125 µm MMF | 2 m | | 2000 m |
| 50/125 µm MMF | 2 m | | 2000 m |

Table 14 lists the specifications for the dual-speed 100FX/1000LX SFP module for Gigabit Ethernet (GE) ports. Operating at 100 Mbps, the dual-speed SFP conforms to the 100BASE-LX10 standard. Operating at 1000 Mbps, the dual-speed SFP conforms to the 1000BASE-LX standard.

**Table 14: Dual-speed 100FX/1000LX SFP Specifications**

| Parameter | 100FX | 1000LX |
|---|---|---|
| Connector type | LC | LC |
| Average launch power range with 9 um SMF | -8 dBm to -15 dBm | -3 dBm to -11 dBm |
| Receiver power range with 9 um SMF | -8 dBm to -25 dBm | -3 dBm to -19 dBm |
| Optical link budget with 9 um SMF | 10 dB | 8 dB |
| Center wavelength range | 1270 to 1355 | 1270 to 1355 |
| Distance range over each optical fiber type (see note below table) | | |
| 62.5/125 µm MMF | 2 to 2000 m | 2 to 550 m |
| 50/125 µm MMF | 2 to 2000 m | 2 to 550 m |
| 9/125 µm SMF | 2 to 10,000 m | 2 to 10,000 m |

**NOTE**

*The 100FX/1000LX SFP module complies with the 100FX-SMF standard. To use the 100FX/1000LX SFP module in 100FX-MMF operation, a minimum attenuation of 6 dB is required. After the SFP module is installed, connect a 6-dB attenuator to the transmitter side (Tx) of the SFP module. Next, connect the attenuator to the single-mode end of a mode conditioning patch cord. The mode conditioning patch cord transitions the SFP module from SMF to MMF operation.*

Table 16 lists specifications for the LX100 SFP module.

**Table 15: LX100 SFP specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| Transmitter | | | |
| Average launch power | 1 dBm | 3 dBm | 5 dBm |
| Center wavelength | 1480 nm | 1550 nm | 1580 nm |
| Receiver | | | |
| Receive sensitivity | | | –30 dBm |
| Average receive power | | | –9 dBm |
| Operating wavelength | 1260 nm | 1550 nm | 1580 nm |

Table 16 lists specifications for the 100BASE-LX10 SFP module.

**Table 16: 100BASE-LX10 SFP Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | –15 dBm | –10 dBm | –8 dBm |
| Center wavelength | 1260 nm | 1310 nm | 1360 nm |
| **Receiver** | | | |
| Receive sensitivity | | | –25 dBm |
| Average receive power | | | –8 dBm |
| Operating wavelength | 1260 nm | 1310 nm | 1360 nm |
| **Link** | | | |
| Link Power Budget | | | 10 dB |

Table 17 lists specifications for the 100BX Bi-directional SFPs. The 100BASE-BX SFP modules conform to the IEEE 802.3ae standard.

**Table 17: 100BASE-BX Bi-directional SFP Specifications**

| Parameter | Minimum | Maximum |
|---|---|---|
| **Transmitter** | | |
| Average launch power | –14 dBm | –8 dBm |
| Center wavelength (100BASE-BX10-D) | 1480 nm | 1580 nm |
| Center wavelength (100BASE-BX10-U) | 1260 nm | 1360 nm |
| **Receiver** | | |
| Receive sensitivity | –28.2 dBm | |
| Average receive power (max) | | –8 dBm |
| **Link** | | |
| Link power budget | | 14.2 dB |

**NOTE**

*The 100BX bidirectional SFPs include two SFP optical devices, the 100BASE-BX-U SFP and the 100BASE-BX-D SFP, which must be used as a pair to allow for a single fiber bidirectional connection.*

Table 13 lists the specifications for the 100BASE-FX SFP module for fast Ethernet (FE) ports.

**Table 18: 100BASE-FX SFP for FE Ports Specifications**

| Parameter | Minimum | Maximum |
|---|---|---|
| **Transmitter** | | |
| Average launch power | -20 dBm | -14 dBm |
| Center wavelength | 1270 nm | 1380 nm |
| **Receiver** | | |
| Receive sensitivity | -31 dBm | |
| Average receive power (max) | | -14 dBm |
| **Distance range over each fiber type** | | |
| 62.5/125 µm MMF | 2 m | 2000 m |
| 50/125 µm MMF | 2 m | 2000 m |

Table 19 lists the specifications for the SR SFP+ modules.

**Table 19: SR SFP+ Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | -7.3 dBm | | -1 dBm |
| Center wavelength | 840 nm | 850 nm | 860 nm |
| **Receiver** | | | |
| Receive sensitivity | | | -11 dBm |
| Average receive power (max) | | | -1 dBm |
| Operating wavelength | 840 nm | 850 nm | 860 nm |
| **Link** | | | |
| Link power budget | | | 7.5 dB |

Table 20 lists the specifications for the LR SFP+ module.

**Table 20: LR SFP+ Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | -8.2 dBm | | 0.5 dBm |
| Center wavelength | 1260 nm | 1310 nm | 1355 nm |
| **Receiver** | | | |
| Average receive power (max) | –14.4 dBm | | –1 dBm |
| Center wavelength | 1260 nm | 1310 nm | 1355 nm |
| Maximum receiver sensitivity in OMA | | | –12.6 dBm |
| Operating distance | | | 10 km |

Table 21 lists specifications for the 10/100/1000BASE-T copper SFP module. The 10/100/1000BASE-T copper SFP module is compatible with the Gigabit Ethernet standard and 1000 Base-T standard as specified in the IEEE 802.3ab standard.

**Table 21: 10/100/1000BASE-T Copper SFP Specifications**

| Parameter | Value |
|---|---|
| Input voltage range | 3.3 V ± 5% |
| Supply current | 375 mA maximum |
| **Link distance for each speed** | |
| 1 Gbps | 100 m using Cat5 cable |
| 100 Mbps | 150 m using Cat5 cable |
| 10 Mbps | 250 m using Cat5 cable |

# XFP Specifications

Table 22 lists the specifications for the LR XFP module.

**Table 22: LR XFP Module Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | -8.2 dBm | | 0.5 dBm |
| Center wavelength | 1260 nm | 1310 nm | 1355 nm |
| **Receiver** | | | |
| Average receiver power (max) | | | 0.5 dBm |
| Center wavelength | 1260 nm | 1310 nm | 1355 nm |
| Stressed receiver sensitivity in OMA | | | -10.3 dBm<br>0.093 mW[1] |
| Operating distance | | | 10 km |

1.$OMA=10\log_{10}[2P\{(A-1)/(A+1)\}]$, $A = 10^{(Er/10)}$, $P = 10^{(Pf/10)}$

Table 23 lists specifications for the ER XFP module.

**Table 23: ER XFP Module Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | –4.7 dBm | | 4 dBm |
| Center wavelength | 1530 nm | | 1565 nm |
| **Receiver** | | | |
| Average receiver power (max) | –11.8 dBm | | –1 dBm |
| Center wavelength | 1260 nm | | 1580 nm |
| Maximum receiver sensitivity in OMA | | | 14.1 dBm[1] |
| Operating distance | | | 40 km |

1.$OMA=10\log_{10}[2P\{(A-1)/(A+1)\}]$, $A = 10^{(Er/10)}$, $P = 10^{(Pf/10)}$

Table 24 lists specifications for the SR XFP module.

**Table 24: SR XFP Module Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | -7.3 dBm | | –1.3 dBm |
| Center wavelength | 840 nm | 850 nm | 860 nm |
| **Receiver** | | | |
| Average receiver power (max) | –9.9 dBm | | –1 dBm |
| Center wavelength | 840 nm | | 860 nm |
| Maximum receiver sensitivity in OMA | | | -11.1 dBm[1] |
| Operating distance | | | 300 m |
| Operating distance range (depends on type and modal bandwidth)<br>62.5 µm MMF (160 MHz*km)<br>62.5 µm MMF (200 MHz*km)<br>50 µm MMF (400 MHz*km)<br>50 µm MMF (500 MHz*km)<br>50 µm MMF (2000 MHz*km) | | | <br>26 m<br>33 m<br>66 m<br>82 m<br>300 m |

1. $OMA=10\log_{10}[2P\{(A-1)/(A+1)\}]$, $A = 10^{(Er/10)}$, $P = 10^{(Pf/10)}$

Table 25 lists specifications for the ZR XFP module.

**Table 25: ZR XFP Module Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | 0.5 dBm | 2 dBm | 4 dBm |
| Center wavelength | 1530 nm | 1550 nm | 1565 nm |
| **Receiver** | | | |
| Average receiver power (max) | | | –7 dBm |
| Center wavelength | | 1550 nm | |
| Receiver sensitivity | –24 dBm | | |
| Operating distance | | | 80 km |

Table 26 lists specifications for the DWDM XFP module. Table 27 lists the transmitter center wavelength for each separate DWDM XFP part number.

### Table 26: DWDM XFP Module Specifications

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | 0.5 dBm | | 4 dBm |
| Center wavelength | | See table | |
| **Receiver** | | | |
| Average receiver power (max) | | | –7 dBm |
| Center wavelength | 1528 nm | | 1565 nm |
| Receiver sensitivity | –24 d Bm | | |
| Operating distance | | | 80 km |

### Table 27: TX Wavelengths and ITU Channels of Extreme Networks DWDM XFPs

| Extreme Networks Part Number | TX Wavelength | ITU Channel | Extreme Networks Part Number | TX Wavelength | ITU Channel |
|---|---|---|---|---|---|
| 10221 | 1560.61 nm | 21 | 10241 | 1544.53 nm | 41 |
| 10222 | 1559.79 nm | 22 | 10242 | 1543.73 nm | 42 |
| 10223 | 1558.98 nm | 23 | 10243 | 1542.94 nm | 43 |
| 10224 | 1558.17 nm | 24 | 10244 | 1542.14 nm | 44 |
| 10225 | 1557.36 nm | 25 | 10245 | 1541.35 nm | 45 |
| 10226 | 1556.56 nm | 26 | 10246 | 1540.56 nm | 46 |
| 10227 | 1555.75 nm | 27 | 10247 | 1539.77 nm | 47 |
| 10228 | 1554.94 nm | 28 | 10248 | 1538.98 nm | 48 |
| 10229 | 1554.13 nm | 29 | 10249 | 1538.19 nm | 49 |
| 10230 | 1553.33 nm | 30 | 10250 | 1537.40 nm | 50 |
| 10231 | 1552.52 nm | 31 | 10251 | 1536.61 nm | 51 |
| 10232 | 1551.72 nm | 32 | 10252 | 1535.82 nm | 52 |
| 10233 | 1550.92 nm | 33 | 10253 | 1535.04 nm | 53 |
| 10234 | 1550.12 nm | 34 | 10254 | 1534.25 nm | 54 |
| 10235 | 1549.32 nm | 35 | 10255 | 1533.47 nm | 55 |
| 10236 | 1548.51 nm | 36 | 10256 | 1532.68 nm | 56 |
| 10237 | 1547.72 nm | 37 | 10257 | 1531.90 nm | 57 |
| 10238 | 1546.92 nm | 38 | 10258 | 1531.12 nm | 58 |
| 10239 | 1546.12 nm | 39 | 10259 | 1530.33 nm | 59 |
| 10240 | 1545.32 nm | 40 | 10260 | 1529.55 nm | 60 |

# XENPAK Specifications

Table 28 lists specifications for the SR XENPAK module

**Table 28: SR XENPAK Module Specifications**

| Parameter | Minimum | Typical | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | -7.3 dBm | | –1.3 dBm |
| Center wavelength | 840 nm | 850 nm | 860 nm |
| **Receiver** | | | |
| Average receiver power (max) | –9.9 dBm | | –1 dBm |
| Center wavelength | 840 nm | | 860 nm |
| Maximum receiver sensitivity in OMA | | | -11.1 dBm[1] |
| Operating distance | | | 300 m |
| Operating distance range (depends on type and modal bandwidth)<br>62.5 µm MMF (160 MHz*km)<br>62.5 µm MMF (200 MHz*km)<br>50 µm MMF (400 MHz*km)<br>50 µm MMF (500 MHz*km)<br>50 µm MMF (2000 MHz*km) | | | <br>26 m<br>33 m<br>66 m<br>82 m<br>300 m |

1.OMA=$10\log_{10}[2P\{(A-1)/(A+1)\}]$, $A = 10^{(Er/10)}$, $P = 10^{(Pf/10)}$

**NOTE**

*The launch power (measured using the average power method used by power meters) is measured at the factory. The average launch power minimum value is provided as a reference, not a pass/fail criterion.*

Table 29 lists specifications for the LR XENPAK module.

**Table 29: LR XENPAK Module Specifications**

| Parameter | Minimum | | Maximum |
|---|---|---|---|
| **Transmitter** | | | |
| Average launch power | -8.2 dBm | | 0.5 dBm |
| Center wavelength | 1260 nm | 1310 nm | 1355 nm |
| **Receiver** | | | |
| Average receiver power (max) | | | 0.5 dBm |
| Center wavelength | 1260 nm | 1310 nm | 1355 nm |
| Stressed receiver sensitivity in OMA | | | -10.3 dBm<br>0.093 mW[1] |
| Operating distance | | | 10 km |

1.OMA=$10\log_{10}[2P\{(A-1)/(A+1)\}]$, $A = 10^{(Er/10)}$, $P = 10^{(Pf/10)}$

Table 30 lists specifications for the ER XENPAK module.

**Table 30: ER XENPAK Module Specifications**

| Parameter | Minimum | Maximum |
|---|---|---|
| Average launch power | -4.7 dBm | 4.0 dBm |
| Optical link budget | | 10.9 dB |
| Wavelength range | 1530 nm | 1565 nm |
| Distance range:<br>5 dBm attentuation | 2 m | 40 km |
| Maximum receiver sensitivity in OMA | | -14.1 dBm |

**NOTE**

*The launch power (measured using the average power method used by power meters) is measured at the factory. The average launch power minimum value is provided as a reference, not a pass/fail criterion.*

Table 31 lists specifications for the ZR XENPAK module

**Table 31: ZR XENPAK Module Specifications**

| Parameter | Minimum | Maximum |
|---|---|---|
| **Transmitter** | | |
| Optical output power | 0 dBm | 4 dBm |
| Center wavelength | 1530 nm | 1565 nm |
| **Receiver** | | |
| Optical input power | -22 dBm | -7 dBm |
| Operating wavelength | 1530 nm | 1565 nm |
| **General** | | |
| Optical link loss | 11 dB | 22 dB |
| Optical dispersion | 0 ps/nm | 1600 ps/nm |
| Distance | | 80 km |

**WARNING!**

*To prevent permanent damage to the ZR XENPAK and other equipment: always check the optical input power of the receiver before inserting the fiber. The maximum optical input power for the receiver is -7 dBm. If you use optical loopback for diagnostics purposes, the loopback requires a minimum of 10 dB optical attenuation. The recommended attenuation range is 10 dB to 15 dB.*

Table 32 lists specifications for the LX4 XENPAK module.

**Table 32: LX4 XENPAK Module Specifications**

| Parameter | Minimum | Maximum |
|---|---|---|
| **Transmitter** | | |
| Average launch power, 4 lanes | | + 5.5 dBm |
| Average launch power, per lane | | - 0.5 dBm |
| Optical modulation amplitude (OMA), per lane:<br>SMF<br>MMF | <br>- 6.25 dBm<br>- 6.75 dBm | <br>- 1.25 dBm<br>- 1.25 dBm |
| **Receiver** | | |
| Average receive power, 4 lanes | | + 5.5 dBm |
| Average receive power, per lane | | - 0.5 dBm |
| Receive sensitivity (OMA), per lane | | - 14.45 dBm |
| **Optical link budget** | | |
| Wavelength range | 1269.0 nm<br>1293.5 nm<br>1318.0 nm<br>1342.5 nm | 1282.4 nm<br>1306.9 nm<br>1331.4 nm<br>1355.9 nm |
| Distance range:<br>SMF<br>MMF | | <br>10 km<br>300 m |

Table 33 lists specifications for the LW XENPAK module.

**Table 33: LW XENPAK Module Specifications**

| Parameter | Measurement |
|---|---|
| **Transmitter Characteristics** | |
| Signaling speed (nominal) | 9.95328 GBd |
| Signaling speed variation from nominal (max) | +/-20 ppm |
| Center wavelength (range) | 1260 to 1355 nm |
| Average launch power (max) | 0.5 dBm |
| Average launch power (min) | -8.2 dBm |
| **Receiver Characteristics** | |
| Center wavelength (range) | 1260 to 1600 nm |
| Average receive power (max) | 0.5 dBm |
| Average receive power (min) | -14.4 dBm |
| Receive sensitivity (max) in OMA | 0.055 (-12.6) uW/dBm |
| **Link Power Budget** | |
| Operation distance | 10 Km |

**CAUTION**

*The maximum input power (average receive power) should be less than 0.5 dBm)*

# Pluggable Interface Module Regulatory Compliance

Extreme Networks pluggable interface modules comply with the following agency requirements:

- Class 1 Laser Product (optical modules only)
- EN60825-1+A2:2001 or later, European laser standard (optical modules only)
- FCC 21 CFR Chapter 1, Subchapter J in accordance with FDA & CDRH requirements (optical modules only)
- Application of CE Mark in accordance with 89/336/EEC EMC and 73/23/EEC Low Voltage Directives
- UL and/or CSA registered component for North America
- 47 CFR Part 15, Class A when installed into Extreme products

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